# SECTION 2 – CONSIDERED PLANS

## NO ACTION

**Information**: The no action plan would result in an information gap that would not allow for the Grand Calumet River system to be adequately restored. A knowledge base of design and ecology would not exist for the further restoration of this highly impaired river system.

**Ecological**: The no action plan would result in preserving the exiting conditions of the discharge channel. Although water quality is sufficient for stream flora and fauna to exist, it is severely limited by sediment composition, the lack of natural hydraulic dynamics and the absence of in-stream habitat. These limiting factors will continue to promote the existence of tolerant and non-native flora and fauna within the project site.

The no action plan would not implement any beneficial change to the environment through Corps funding. It is unlikely that local sponsors have sufficient funds to proceed with ecological restoration independently; therefore there would be no future restoration activities at this site. Without this project, small stream habitat and plant communities within the study area will remain in a state of high degradation and low diversity. Water quality will most likely continue to improve, but habitat (plant communities, substrate and in-stream structure) will not recover without the direct physical restoration activities. Without this project, food web dynamics will still incorporate the factor of bioaccumulation of harmful organic compounds that are currently, and will continue to be present in the sediments of the East Chicago discharge channel. In particular, the feeding habitat of the state endangered black crowned night heron (*Nycticorax nycticorax*) will continue to be of low quality and insufficient. Without this project to begin the long process of basin wide restoration, it may impossible to ever reintroduce rare and charismatic species such as the lake sturgeon (*Acipenser fulvescens*), river otter (*Lutra canadensis*) and giant floater (*Pyganodon grandis*). Without this demonstration project valuable knowledge that is applicable to the entire Grand Calumet River system would not be gained.

## MEASURES of THE SELECTED PLAN

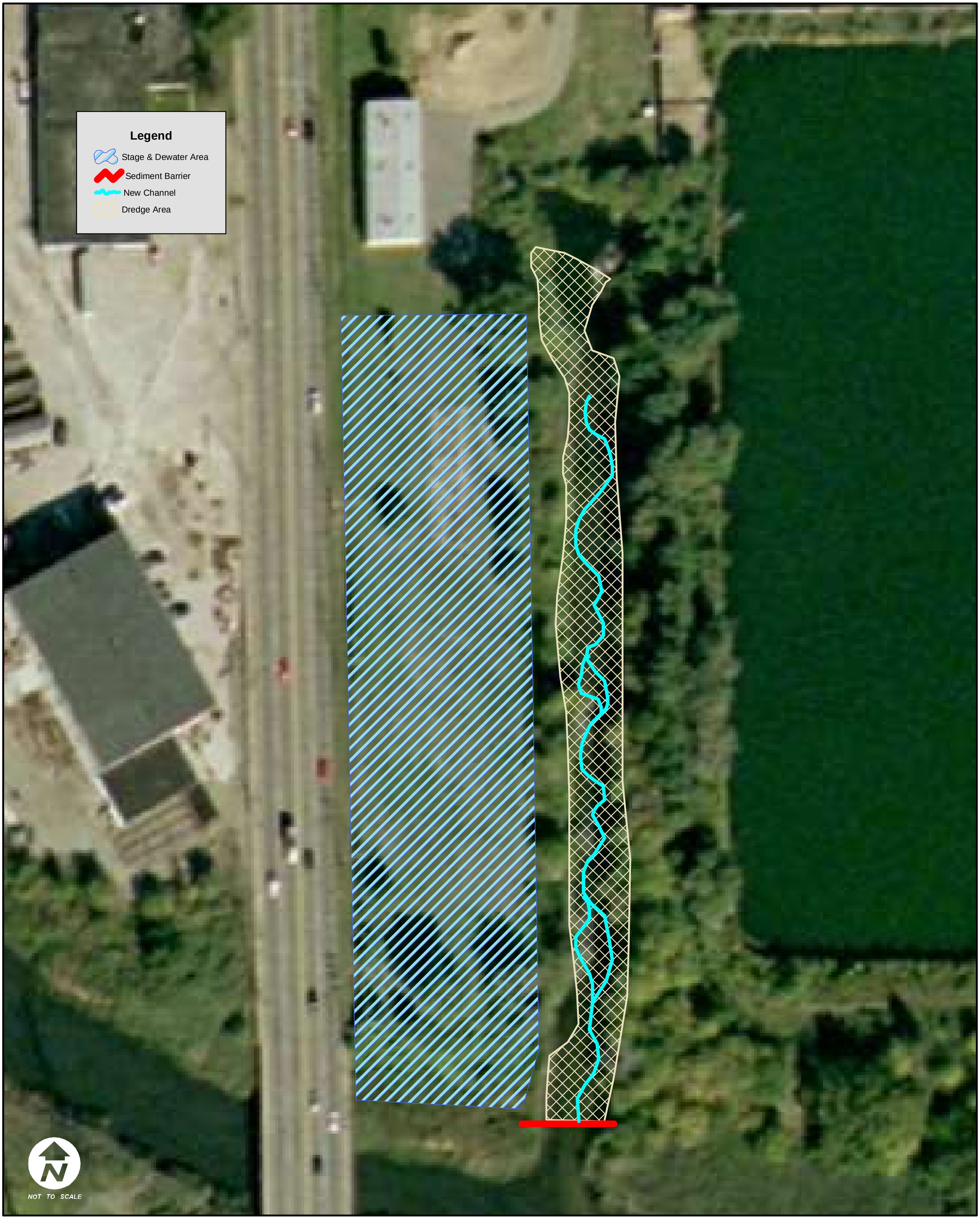
The selected measures were chosen via coordination with experts from state and federal agencies. These measures were determined to be the most effective in terms of sediment remediation and habitat restoration for the project site.

### <u>1. Sediment Barrier</u>

The sediment barrier will serve to separate the contaminated sediment of the Grand Calumet River from the rehabilitated discharge channel. The barrier will be installed prior to dredging at the downstream end of the discharge channel prior to its intersection with the Grand Calumet River (Plate B). After dredging is complete, the channel will be backfilled with the new substrates up to the termination of the channel at the sediment barrier. At this point the barrier will have no real structural function and it will not affect flow within the channel. We are currently considering three different options for the design. Considering that all options being considered will be able to fulfill the simple engineering function of serving as a barrier, the design selection will be based mainly on cost and its relation to disturbance and simplicity. This barrier would become obsolete once the Grand Calumet River is restored.

# Sediment Remediation Plan

**Plate B**



Option 1 – Sheet Pile
The first design option is a sheet pile barrier that will be installed into the hardpan below the soft sediment and rise up to the top of the contaminated sediment. This will certainly be effective at keeping the two regions separated though it has several disadvantages. There will be a high cost to mobilize the pile driver to do the installation. Also, driving the pile will be a noisy operation which may disturb the black crowned night herons that nest in the trees nearby. Since sheet pile is typically used for structural support, using it for this application could be considered an over design.

Option 2 – Submerged Wall
The final design option involves the use of grout or Quickrete concrete bags that will serve as the barrier. Contaminated sediment will be excavated in a trench across the channel and stone and precast panels will be laid down as a support for the wall. The wall will then be built up to the level of the sediment and then backfilled to conceal its visibility. This is good option since, like the panels, it offers little disturbance and a minimal cost, though it will be highly labor intensive (requiring workers in the stream to install the bags and build the wall).

Option 3 –Precast Concrete Panels
The second option being considered involves using a series of vertical precast panels that would be installed across the channel. The vertical panels will be supported by horizontal panels placed below the contaminated sediment on both sides of the vertical panels. The contaminated sediment would first be dredged out in a trench across the channel so that the horizontal panels can be installed. The vertical panels will then be installed between the two rows of horizontal panels; if necessary they can be pushed down into the hardpan using heavy equipment. This design is a good option since additional heavy equipment will not be needed to install the wall (the only heavy equipment needed is a crane which will already be on site for the dredging operation); this will cut down on the cost of the operation. Additionally, very little help will be needed from laborers in the water. This is important since working in the channel can be dangerous due to the unstable nature of the sediment. This option has been selected for implementation.

## 2. Removal of Contaminated Sediments and Foreign Debris

To begin developing this project the first step will be to remove the contaminated sediment. Surveys conducted in spring / summer 2002 determined the 2500 $yd^3$ to be the quantity of contaminated sediment in the channel (see HTRW Appendix I).

The HTRW investigation performed in 2001 revealed contamination at levels that would preclude any beneficial use application and necessitate disposal of the material in a Subtitle D landfill. Local landfills were contacted.

Dredging is critical feature to the success of the project. The contaminated sediments present in the channel are the most severe impediment to developing a healthy aquatic community of fish and invertebrates. Without dredging the contaminated sediment, performing any of the other restoration activities would be futile. Restoration of the ecosystem cannot be done without removing the contamination. Most of the specific procedures for the dredging operations for this project will be left up to the contractor. Since the contractors themselves have the most experience with small dredging operations such as this one, it would be more appropriate for them to develop the specific design. USACE will provide specific restraints for the operation: 1) Dredge material must be dewatered to the point that it will pass the Paint Filter test (the wastewater treatment intake on site may be used for disposing of any decant or pore water that may be generated during this process), 2) The material must be placed in a lined, subtitle D landfill that will accept Special Waste material. Additional restraints may be required as outlined in the 401 water quality certification for the project, such as a specified type of dredging bucket, a silt curtain, or the time of year that dredging can be performed due to the risk of volatilizing organic contaminants in warmer weather. In all likelihood the contractor will use some form of mechanical dredging, which will produce a much drier material than a hydraulic dredging operation. The field directly adjacent to the dredging operation (Plate B) can be used for drying or dewatering operations that may be required. The possibility also exists for a hydraulic operation using geotubes. The fact that the project operation is on the site of a wastewater treatment plant with a convenient location for pumping decant water brings hydraulic dredging under the realm of possibilities.

Due to the steep bank and the required distance to reach the channel, the dredging apparatus will require a long horizontal reach to access the sediment. This will require the use of either a crane with attached clamshell dredging bucket or a large hydraulic excavator able to achieve the required horizontal reach (at least 50 feet). The dredging apparatus will be placed on the firm soil on top of the bank and each load of sediment will be placed in a temporary holding pan where the sediment can settle leaving the pore water. This pore water will be pumped to the sanitary sewer access location where the water will return to the head-works of the wastewater treatment plant. After dewatering, the sediment can be transferred to a Subtitle D landfill. Trucks with sealed beds will perform transfer so that none of the pore water can seep out of the vehicles during transport.

## 3. Channel Restoration

### A. Channel Re-meandering

Currently, the stream channel is a 45-foot wide ditch for conveyance of discharge water into the Grand Calumet River. This channelized ditch offers minimal, if any habitat diversity and structure through stream morphology for aquatic species. The Grand Calumet River system possessed streams characterized by wide pools and tight constrictions of sand and aquatic macrophytes. Thus the Grand Calumet system did not possess defined cobble riffle morphology. Due to unnatural hydraulic regimes, these sand based constrictions and pools could not be replicated or otherwise they would be blown-out after the first storm event.

To restore to a more natural configuration, the straightened ditch requires meandering. The wetted with of the stream would be about 10 - 15 feet where pools should be and 8 feet where riffles should be, like a natural stream. Meanders would be created through the placement of natural cobble and gravel bars. This measure would restore approximately 600 feet of channelized stream into a meandering and more natural stream (Plate C). This measure would provide critical habitat for aquatic plants and organisms that require these plants. It would also provide diversity in stream structure and flows that are required by lotic organisms.

Design criteria for this measure are 1) to restore a sinusoidal meander to the ditched channel resembling a natural stream; 2) the meanders must be within the current banks; 3) the east bank must not be impacted by any change in flow regimes.

### B. Base Substrate

Natural substrata of the Grand Calumet River system, including the East Chicago Sanitary District discharge channel have become highly degraded in chemical as well as physical composition. Stream organisms are no longer able to survive in these substrata for these reasons alone.

Once all the dredged material is removed from the discharge channel, a clean, base substrata would be placed. The base substrata would be first a clay hardpan. This very fine and cohesive clay material would be placed in the channel and then be tamped down via a backhoe. Over a short period this clay hard pan will become hard and bound together; therefore it will not wash away overtime. Clay hardpan will provide structure for stream organisms to reside in, particularly

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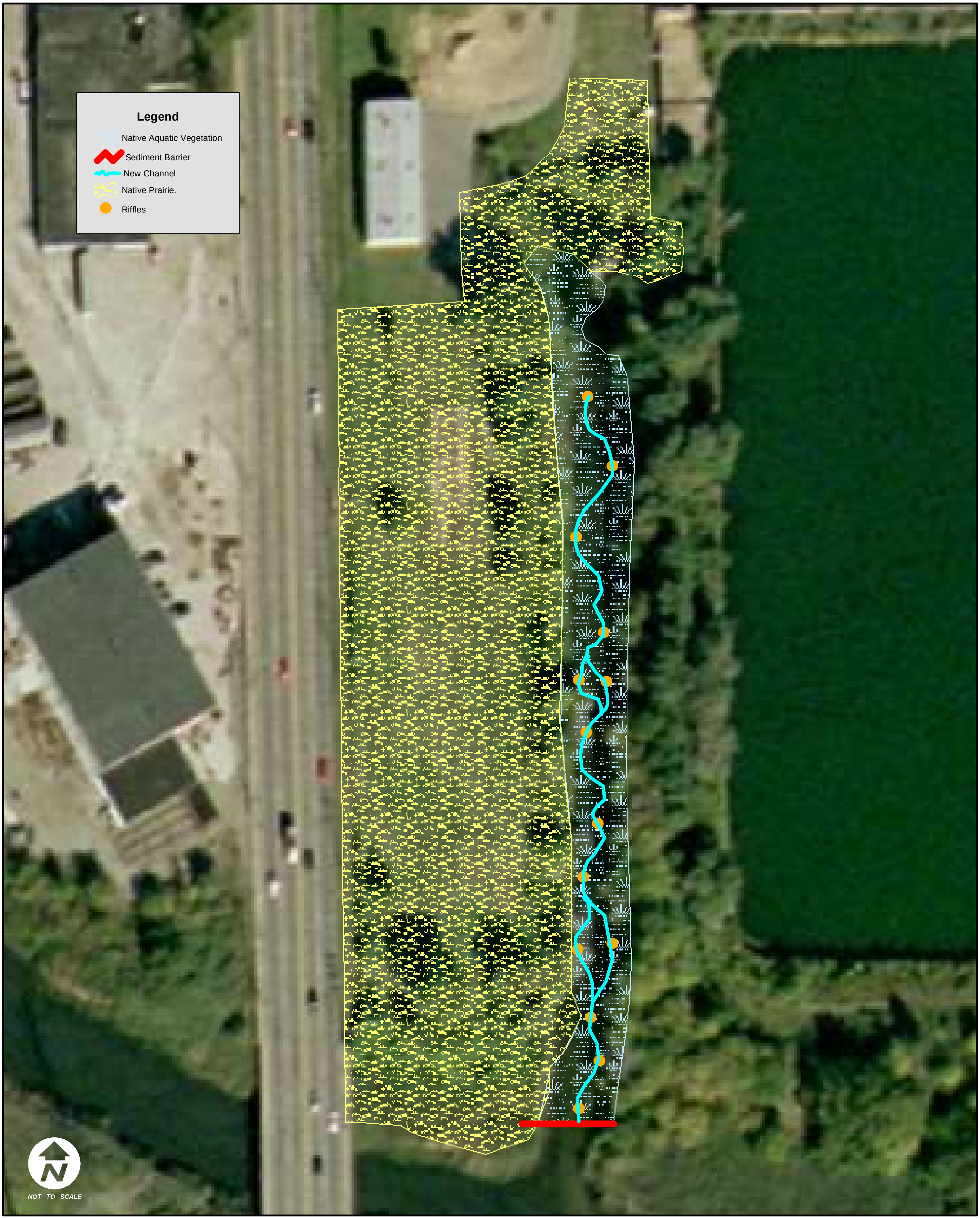
# Restoration Plan

**Plate C**



burrowing benthic invertebrates such as the virile crayfish (*Orconectes virilus*). This measure would restore approximately 600 feet of stream base substrata.

Over the clay hardpan, a sand and gravel mixture, replicating glacial till and lacustrine sands will be placed in bowl shaped fashion as to run up sides of the banks. Placement of this fill is dependent on other measures the channel would be treated with. Boulders, cobble and gravel will also be placed as clean substrata, but would mostly be used in constructing riffles and bank tows. Sand and gravel bars may also be created to diversify habitat, diversify flows and provide substrata for aquatic plants.

Design criteria for this measure are 1) to restore base substrates that replicate sand, glacial tills and clay hardpan; 2) the placement of this clean base substrata should be as base, and not fill the entire channel back to its previous elevation; 3) clay hardpan replication should also function as a barrier to deeper lying contamination sources.

<u>C. Riffle Creation</u>

Riffle-pool sequences are one of the preferred methods to restore degraded stream habitat. The placement of a riffle would increase habitat diversity in terms of substrata and flow. Compared to the uniform flow conditions of a channelized reach, cobble riffles increase and diversify the velocity of flow, which in turn increases the complexity of in-stream habitat, the essential for a diverse aquatic community. These riffles provide substrate and flow velocity for water filtering bacteria and macroinvertebrates, and improve water quality by facilitating gas exchange.

The Calumet River system possessed streams characterized by wide pools and tight constrictions consisting of sand and aquatic macrophytes. Thus the Calumet River system did not possess defined cobble riffle morphology. Due to unnatural hydraulic regimes, these sand based constrictions and pools may not be replicated, otherwise they would be "blown-out" after the first storm event. Therefore, riffle-pool sequences would be placed within the discharge channel. These riffles would be created from alluvial material (not rip-rap chunks) of boulders, cobbles, gravel, and sand resembling substrates of the region and would be sized properly to with stand unnatural flows during peak discharge of the treatment plant.

Design criteria for this measure are: 1) riffle must be constructed to provide critical flows for stream invertebrates and fishes; 2) must be constructed of natural material to provide spawning habitat for simple lithophil species; 3) must provide scour pools (3 feet) for larger stream fishes.

<u>D. In-stream Habitat</u>

The absence of in-stream structure and habitat is another limiting resource in the ECSD discharge channel. Due to the ditched condition of the channel, tree roots, herbaceous vegetation root mats, aquatic macrophytes and undercut banks are absent.

Woody debris would be obtained from any of the trees that would be removed from the banks. Tree trunks should be placed at random within the streambed. Tree root masses should be placed at the tow of banks at the pool areas as to serve as undercut bank habitat. Maneuvering of these objects may be necessary once the stream has reached its new equilibrium. Native aquatic macrophytes such as lizard's tail (*Saururus cernuus*), pickerel weed (*Pontedaria cordata*) and bulrush (*Scirpus* spp.) would be planted or encouraged to grow in the headwater area of the newly restored stream.

Table 1: Suggested planting list for in-stream habitat.

| SCIENTIFIC NAME | COMMON NAME | SCIENTIFIC NAME | COMMON NAME |
|---|---|---|---|
| *Acorus calamus* | SWEETFLAG | *Juncus dudleyi* | DUDLEY'S RUSH |
| *Alisma subcordatum* | COMMON WATER PLANTAIN | *Juncus effusus* | COMMON RUSH |
| *Bidens cernua* | NODDING BUR MARIGOLD | *Leersia oryzoides* | RICE CUTGRASS |
| *Bidens coronata* | TALL SWAMP MARIGOLD | *Mimulus ringens* | MONKEY FLOWER |
| *Calamagrotis canadensis* | BLUE JOINT GRASS | *Polygonum hydropiperoides* | WATER PEPPER |
| *Carex comosa* | BRISTLY SEDGE | *Pontedaria cordata* | PICKEREL WEED |
| *Carex cristatella* | CRESTED OVAL SEDGE | *Potamogeton nodosus* | LONG-LEAVED PONDWEED |
| *Carex emoryi* | RIVERBANK SEDGE | *Potamogeton pectinatus* | SAGO PONDWEED |
| *Carex stipata* | COMMON FOX SEDGE | *Rudbeckia laciniata* | WILD GOLDEN GLOW |
| *Carex vulpinoidea* | BROWN FOX SEDGE | *Sagittaria latifola* | BROADLEAF ARROWHEAD |
| *Cephalanthus occidentalis* | COMMON BUTTONBUSH | *Saururus cernuus* | LIZARD'S TAIL |
| *Cyperus esculentus* | FIELD NUT SEDGE | *Scirpus fluviatilus* | RIVER BULRUSH |
| *Echinochloa crusgalli* | BARNYARD GRASS | *Scirpus pungens* | CHAIRMAKER'S RUSH |
| *Eleocharis smallii* | MARSH SPIKE RUSH | *Scirpus validus creber* | GREAT BULRUSH |
| *Eupatorium perfoliatum* | COMMON BONESET | *Spartina pectinata* | PRAIRIE CORD GRASS |
| *Iris virginica shrevei* | BLUE FLAG | | |

Design criteria for this measure are: 1) tree root masses should be obtained from the trees that will be removed from the site; 2) undercut banks with root structure should be restored to provide cover for fishes; 3) native aquatic macrophytes should be propagated within the headwater of the stream for native fish spawning and cover.

E. Introduction of Native Fish Species

The main stem of the Grand Calumet River is highly degraded and very inhospitable to all but the tolerant and more vagile species. Once the East Chicago Sanitary District site is restored, it is of great importance to determine whether or not species would be able to tolerate and sustain them at the site.

This measure would consist of reintroducing warm water native fishes into the sanitary district discharge channel after the restored stream has become stabilized. Fishes would be collected from nearby streams in which they are abundant and in no danger of becoming rare. These fishes would be enumerated by species and released into the now restored ECSD stream. The ECSD stream would be sampled twice a year for the next five years. One sampling event would occur in May – June to determine if fishes are spawning in the restored stream. Another sampling event would occur in the fall to determine recruitment.

The project would result in the decline of non-native and tolerant species of fish such as common carp, goldfish and round goby, and would provide habitat and stream conditions for moderately sensitive and native species to be sustained. The current IBI score for the earthen channel is 26, rating it as a limited resource. It is recommended to introduce fish species to determine the ecological sustainability of the restored channel since it is unlikely that native stream fishes would not colonize through the hostile Grand Calumet River main stem. It is recommended to introduce the following species:

Table 2: List of recommended fish species for introduction into the restored ECSD discharge channel

| Family | Species | Common Name | Local Abundance | Tolerance Level | Trophic Guild | Spawning Guild | Source Stream | Number Intro |
|---|---|---|---|---|---|---|---|---|
| Umbridae | *Umbra limi* | central mudminnow | high | high | insectivore | general | Salt | 50 |
| Esocidae | *Esox americanus* | grass pickerel | moderate | moderate | piscivore | vegetation | Plum | 5 |
| Cyprinidae | *Semotilus atromaculatus* | creek chub | high | high | generalist | general | Trail/Plum | 100 |
| | *Nocomis biguttatus* | hornyhead chub | high | moderate | insectivore | lithophilic | Plum | 100 |
| | *Campostoma anomalum* | central stoneroller | high | moderate | herbivore | lithophilic | Plum | 100 |
| | *Rhinichthys atratulus* | blacknose dace | high | moderate | generalist | lithophilic | Plum | 50 |
| | *Luxilus chrysocephalus* | striped shiner | high | moderate | insectivore | lithophilic | Plum | 50 |
| | *Luxilus cornutus* | common shiner | moderate | moderate | insectivore | lithophilic | Plum | 20 |
| | *Cyprinella spiloptera* | spotfin shiner | high | moderate | insectivore | general | Plum/Trail | 100 |
| | *Notropis stramineus* | sand shiner | high | moderate | insectivore | general | Trail/Lake Michigan | 100 |
| Catostomidae | *Erimyzon sucetta* | lake chubsucker | moderate | moderate | generalist | general | Kankakee Sands Area | 25 |
| Percidae | *Percina maculata* | blackside darter | moderate | moderate | insectivore | lithophilic | Plum/Trail | 25 |
| | *Etheostoma nigrum* | Johnny darter | high | moderate | insectivore | general | Plum/Trail | 50 |

The introduction of these fish would increase the IBI from 26 to 35 – 40, which would then characterize the stream as valued resource. The source bodies of water from which these species would be introduced could be assessed to compare the restoration reach with a naturally "diverse" stream. The suggested sources are:

- Trail Creek: La Porte Co., IN (flows into Lake Michigan)
- Plum Creek: Will Co., IL (flows into the Little Calumet River)
- Salt Creek: Porter Co., IN (flows into the Little Calumet River)
- Lake Michigan: Lake Co., IN (Wihala Beach)
- Kankakee Sands Area: Newton Co., IN (various ditches of remnant Beaver Lake)

Design criteria for this measure are: 1) introduction of native fish species of intermediate tolerance with the unlikelihood of re-colonization; 2) selected species once occurred, or occur in other sections of the Grand Calumet River system; 3) would be monitored for at least five years to provide evidence of recruitment

**4. Bank Restoration**

Currently the west bank of the discharge channel has been overgrown with weedy and non-native plant species. Also, the bank is unnatural in shape and material, which as become inhospitable to native plant species.

The area compromising the west bank of the discharge channel was once used as a Municipal Solid Waste (MSW) landfill prior to the 1950's (the exact dates of use are known from knowledge gleaned from employees at the East Chicago Sanitary District it was likely used in the 1930's and 40's). Investigative test pits were dug along this bank in August 2002 in order to ascertain the type of material that exists in the bank. A backhoe was used to dig 5 pits equally spaced along the length of the channel and down to the approximate level of water in the channel. From the five test pits that were dug, MSW was only seen in the three more southerly-located test pits. MSW that was seen consisted mainly of bottles and broken glass as well as bits and some larger pieces of metal. Material that was seen would not be considered hazardous as classified by RCRA or TSCA and therefore disposal would not be especially difficult or expensive. Test pits where MSW was seen the quantity was relatively small. The main component of the material was soil and separating the MSW from the soil is very feasible when construction takes place. MSW separated from the soil can be taken to the East Chicago Transfer Station, without any additional charge and disposed of like any other similar type of material.

The process of rehabilitating the banks will begin by using a backhoe to slope back the existing bank. This will serve to both remove some of the existing vegetation on the bank as well as serve the function of establishing the required topography of the bank. As mentioned above, the uncontaminated soil that is removed will have to be separated from the foreign debris; this will have to be done by combination of shovels, sifting grates, hand, and by the backhoe. The soil that will be removed will be spread over the adjacent field for prairie and savanna restoration. All exotic plant species will be removed. Cobbles, gravel and sand should be placed at the tow of the newly graded banks for stabilization at the bank water interface, and to support native vegetation, such as lizard's tail. A native ground cover seed mix will be applied in conjunction with a biodegradable coconut fiber erosion control blanket in order to control erosion on the bank until next spring when native vegetation can be planted. As vegetation emerges in the spring additional spot treatments of herbicide may have to be applied to control unwanted species and then native prairie seeds can begin to be planted.

Removal of existing invasive vegetation and replanting with native species plants is often an empirical process; depending on how the exotic vegetation reacts to countermeasures and how well native seeds, plugs, and trees grow determines the next step to take. Generally this means an alternating pattern of seeding and herbicide application or controlled burns/mowing in order to completely eradicate exotic and invasive species and encourage native vegetation to grow. To completely and successfully establish a community of native species plants could take up to 3-5 years. Table 3 provides a list of plants that will be used along the banks. A hired contractor will perform all herbicide and planting work. The area would need annual mowing and spot herbicide to maintain diversity throughout the project life.

Table 3: Suggested planting list for banks.

| SCIENTIFIC NAME | COMMON NAME |
|---|---|
| *Acorus calamus* | SWEET FLAG |
| *Alisma subcordatum* | COMMON WATER PLANTAIN |
| *Andropogon gerardii* | BIG BLUESTEM GRASS |
| *Andropogon scoparius* | LITTLE BLUESTEM GRASS |
| *Aster laevis* | SMOOTH BLUE ASTER |
| *Aster novae-angliae* | NEW ENGLAND ASTER |
| *Aster simplex* | PANICLED ASTER |
| *Bidens frondosa* | COMMON BEGGAR'S TICKS |
| *Bouteloua curtipendula* | SIDE-OATS GRAMA |
| *Calamagrostis canadensis* | BLUE JOINT GRASS |
| *Carex comosa* | BRISTLY SEDGE |
| *Coreopsis tripteris* | TALL COREOPSIS |
| *Echinochloa crusgalli* | BARNYARD GRASS |
| *Elymus canadensis* | CANADA WILD RYE |
| *Elymus virginicus* | VIRGINIA WILD RYE |
| *Iris virginica shrevei* | BLUE FLAG |
| *Juncus effusus* | COMMON RUSH |
| *Justicia americana* | WATER WILLOW |
| *Lobelia cardinalis* | CARDINAL FLOWER |
| *Monarda fistulosa* | WILD BERGAMOT |

| SCIENTIFIC NAME | COMMON NAME |
|---|---|
| *Panicum virgatum* | SWITCH GRASS |
| *Peltandra virginica* | ARROW ARUM |
| *Petalostemum purpureum* | PURPLE PRAIRIE CLOVER |
| *Polygonum pensylvanicum* | PINKWEED |
| *Pontederia cordata* | PICKEREL WEED |
| *Pycnanthemum virginianum* | COMMON MOUNTAIN MINT |
| *Ratibida pinnata* | YELLOW CONEFLOWER |
| *Rudbeckia hirta* | BLACK-EYED SUSAN |
| *Sagittaria latifolia* | COMMON ARROWHEAD |
| *Saururus cernuus* | LIZARD'S TAIL |
| *Scirpus validus creber* | GREAT BULRUSH |
| *Silphium laciniatum* | COMPASS PLANT |
| *Silphium terebinthinaceum* | PRAIRIE DOCK |
| *Solidago rigida* | STIFF GOLDENROD |
| *Sorghastrum nutans* | INDIAN GRASS |
| *Sparganium eurycarpum* | COMMON BUR REED |
| *Spartina pectinata* | PRAIRIE CORD GRASS |
| *Tradescantia ohiensis* | COMMON SPIDERWORT |
| *Vernonia fasciculata* | COMMON IRONWEED |
| *Viburnum lentago* | NANNYBERRY |

The restoration of this bank would provide a viable and productive riparian zone for aquatic, semi-aquatic and terrestrial species. This measure would be especially beneficial to bird species such as black crowned night herons (*Nycticorax nycticorax*) in providing greater cover and a higher quality food source. This measure would restore 2 acres of riparian vegetation and habitat.

Design criteria for this measure are: 1) bank must be configured to a more natural slope; 2) bank must be able to support native vegetation; 3) all work must not adversely impact the stream channel.

F. Prairie / Savanna Landscaping

The adjacent open area to the west of the channel would be restored by landscaping with native prairie and savanna species (Table 3). This measure would be the last step in the restoration process. Initially, all non-native species would be eliminated. Then the area would be slightly graded and the surface soil loosened. Finally the site would be seeded with native prairie and savanna seed as well as planting a few black oak (*Quercus velutina*) trees. The area would need annual mowing and spot herbicide to maintain diversity throughout the project life.

Table 3: Suggested planting list for Prairie / Savanna Landscaping

| **SCIENTIFIC NAME** | **COMMON NAME** | **SCIENTIFIC NAME** | **COMMON NAME** |
|---|---|---|---|
| *Andropogon gerardii* | BIG BLUESTEM GRASS | *Hieracium canadense fas.* | CANADA HAWKWEED |
| *Andropogon scoparius* | LITTLE BLUESTEM GRASS | *Krigia biflora* | FALSE DANDELION |
| *Calamovilfa longifolia magna* | SAND REED | *Lespedeza capitata* | ROUND-HEADED BUSH CLOVER |
| *Elymus canadensis* | CANADA WILD RYE | *Liatris aspera* | ROUGH BLAZING STAR |
| *Eragrostis spectabilis* | PURPLE LOVE GRASS | *Liatris cylindracea* | CYLINDRICAL BLAZING STAR |
| *Koeleria cristata* | JUNE GRASS | *Lithospermum canescens* | HOARY PUCCOON |
| *Panicum oligosanthes scr.* | SCRIBNER'S PANIC GRASS | *Lithospermum croceum* | HAIRY PUCCOON |
| *Panicum virgatum* | SWITCH GRASS | *Lupinus perennis occidentalis* | WILD LUPINE |
| *Sorghastrum nutans* | INDIAN GRASS | *Monarda fistulosa* | WILD BERGAMOT |
| *Stipa spartea* | PORCUPINE GRASS | *Monarda punctata* | HORSE MINT |
| *Arabis lyrata* | SAND CRESS | *Phlox pilosa* | SAND PRAIRIE PHLOX |
| *Artemisia caudata* | BEACH WORMWOOD | *Ratibida pinnata* | YELLOW CONEFLOWER |
| *Erigeron strigosus* | DAISY FLEABANE | *Rudbeckia hirta* | BLACK-EYED SUSAN |
| *Oenothera biennis* | COMMON EVENING PRIMROSE | *Scrophularia lanceolata* | EARLY FIGWORT |
| *Anemone cylindrica* | THIMBLEWEED | *Silphium integrifolium deamii* | DEAM'S ROSIN WEED |
| *Asclepias tuberosa* | BUTTERFLY WEED | *Solidago speciosa* | SHOWY GOLDENROD |
| *Aster azureus* | SKY-BLUE ASTER | *Tephrosia virginiana* | GOAT'S RUE |
| *Aster ericoides* | HEATH ASTER | *Tradescantia ohiensis* | COMMON SPIDERWORT |
| *Baptisia leucantha* | WHITE WILD INDIGO | *Verbena stricta* | HOARY VERVAIN |
| *Comandra umbellata* | FALSE TOADFLAX | *Carex brevior* | PLAINS OVAL SEDGE |
| *Coreopsis lanceolata* | SAND COREOPSIS | *Carex muhlenbergii* | SAND BRACTED SEDGE |
| *Desmodium canadense* | SHOWY TICK TREFOIL | *Amorpha canescens* | LEAD PLANT |
| *Desmodium paniculatum* | PANICLED TICK TREFOIL | *Ceanothus americanus* | NEW JERSEY TEA |
| *Desmodium sessilifolium* | SESSILE-LEAVED TICK TREFOIL | *Opuntia humifusa* | EASTERN PRICKLY PEAR |
| *Erigeron pulchellus* | ROBIN'S PLANTAIN | *Rosa carolina* | PASTURE ROSE |
| *Euphorbia corollata* | FLOWERING SPURGE | *Salix humilis* | PRAIRIE WILLOW |
| *Heliopsis helianthoides* | FALSE SUNFLOWER | *Quercus velutina* | BLACK OAK |
| *Helianthus occidentalis* | WESTERN SUNFLOWER | | |